CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Thorton Creek
Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1997

INTRODUCTION

A stream inventory was conducted during the fall of 1997 on Thorton Creek. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish, and other aquatic species with an emphasis on anadromous salmonids in Thorton Creek. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution.

The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for Chinook salmon, coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Thorton Creek is a tributary to Franz Creek which flows into Maacama Creek, a tributary of the Russian River, located in Sonoma County, California (see Thorton Creek map, page 2). The legal description at the confluence with the Franz Creek is T9N, R7W, S32. Its location is 038°34'59.03" N. latitude and 122°40'13.80" W. longitude. Year round vehicle access exists from Highway 101, exit Mark West Springs Road and travel east. Turn north on Franz Valley Road and east on Franz Valley School Road. The mouth of Thorton is located approximately 150' upstream of the Franz Valley School Bridge.

Thorton Creek and its tributaries drain a basin of approximately 1.8 square miles. Thorton Creek is a first order stream and has approximately 2 miles of blue line stream, according to the USGS Mark West Springs 7.5 minute quadrangle. Summer flow was not measured. Elevations range from about 560 feet at the mouth of the creek to 1075 feet in the headwaters. Coniferous and deciduous forest dominates the watershed, but there are zones of grassland and oak-woodland in the upper watershed. The watershed is owned primarily by the private landowners.

METHODS

The habitat inventory conducted in Thorton Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1994). The Americorps Volunteers that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two person team and was supervised by Bob Coey, Russian River Basin Planner (DFG).

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the California Salmonid Stream Habitat Restoration Manual. This form was used in Franz Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated. Flows were also measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1996). This methodology is described in the California Salmonid Stream Habitat Restoration Manual. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

3. Temperatures:

Water and air temperatures, and time, are measured by crew members with hand held thermometers and recorded at each tenth unit typed. Temperatures are measured in Fahrenheit at the middle of the habitat unit and within one foot of the water surface.
Temperatures are also recorded using remote Temperature recorders which log temperature every two hours, 24 hours/day.

4. Habitat Type

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "DRY". Thorton Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All unit lengths were measured, additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (length, mean width, mean depth, maximum depth and pool tail crest depth). All measurements were in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Thorton Creek, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). Additionally, a rating of "not suitable" (NS) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In Thorton Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. Thus, shelter ratings can range from 0-300, and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully measured habitat units, dominant and sub-dominant substrate elements were visually

estimated using a list of seven size classes.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual, 1998. Canopy density relates to the amount of stream shaded from the sun. In Thorton Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated visually into percentages of evergreen or deciduous trees.

9. Bank Composition:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Thorton Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully measured unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE IV data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. Refer to parent stream report for discussion of methods. This program processes and summarizes the data, and produces the following tables and appendices:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types

- Maximum pool depths by habitat types
- Shelter by habitat types
- Dominant substrates by habitat types
- Vegetative cover and dominant bank composition
- Fish habitat elements by stream reach

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Thorton Creek include:

- Level II Habitat Types by % Occurrence and % Total Length
- Level IV Habitat Types by % Occurrence
- Pool Habitat Types by % Occurrence
- Maximum Depth in Pools
- Pool Shelter Types by % Area
- Substrate Composition in Low Gradient Riffles
- Percent Cobble Embeddedness by Reach
- Mean Percent Canopy
- Mean Percent Canopy by Reach
- Percent Bank Composition and Bank Vegetation

HISTORICAL STREAM SURVEYS:

The Department of Fish and Game conducted a minimal survey of Thorton Creek in 1983. Steelhead, sculpin, green sunfish, crayfish, and western roach were observed.

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of Thorton Creek was conducted from 11/10/97 to 11/14/97 by S. Carey, S. Tarbell and S. Nossaman, (AmeriCorps). The survey began at the confluence with Franz Creek and extended up Thorton Creek, to the end of the survey. The total length of the stream surveyed was 8060 feet, with an additional 26 feet of side channel.

Flows were not measured on Thorton Creek.

This section of Thorton Creek has three channel types: from the mouth to 5873 feet an F3; next 1068 feet a G2 and the upper 1119 feet an F3.

F3 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly cobble substrate.

G2 channel types are characterized as well entrenched "gully" step-

pool channels with a low width/depth ratio, a moderate gradient (2-4%) and a predominantly boulder substrate.

Water temperatures ranged from 49°F to 51°F. Air temperatures ranged from 50°F to 59°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 49% pool units, 43% flatwater units, 8% riffle units, and 1% dry streambed units. Based on total **length** there were 76% flatwater units, 21% pool units, 2% riffle units, and 0% dry streambed units (Graph 1).

One hundred and one habitat units were measured and 26% were completely sampled. Thirteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were runs at 23%, step runs 19%, mid-channel pools 17% and root wad scour pools 15% (Graph 2). By percent total **length**, runs made up 43%, step runs 33%, mid-channel pools 7%, and root wad scour pools 7%.

Forty nine pools were identified (Table 3). Scour pools were most often encountered at 61%, and comprised 61% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. 33 of the 49 pools (67%) had a depth of two feet or greater (Graph 4). These deeper pools comprised 15% of the total length of stream habitat.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Pool types had the highest shelter rating at 23. Riffle had the lowest rating with 5 and flatwater rated 20 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 24, and main channel pools rated 22.(Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were root masses at 28%, boulders 23%, undercut banks 16%, and terr. vegetation 16%. Graph 5 describes the pool shelter in Thorton Branch, Franz.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in one of the two low gradient riffles measured. Small cobble was dominant in one of the low gradient riffles (Graph 6).

No mechanical gravel sampling was conducted in 1997 surveys due to

inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 49 pool tail-outs measured, eight had a value of 1 (16%); nineteen had a value of 2 (39%); seven had a value of 3 (14%); and fifteen had a value of 4 (31%). On this scale, a value of one is best for fisheries.

The mean percent canopy density for the stream reach surveyed was 92%. The mean percentages of deciduous and evergreen trees were 63% and 37%, respectively. Graph 8 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 83% and the mean percent left bank vegetated was 73%. For the habitat units measured, the dominant vegetation types for the stream banks were: 52% brush, 28% evergreen trees, 19% deciduous trees, 2% grass and 0% bare soil. The dominant substrate for the stream banks were: 86% silt/clay/sand, 9% boulder, 3% bedrock and 2% cobble/gravel (Graph 10).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

Steelhead were observed during the habitat inventory, but no electrofishing was conducted in Thorton Creek in 1997.

A summary of historical and recent data collected appears in the table below.

Species Observed in Historical and Recent Surveys

YEARS	SPECIES	SOURCE	Native/Introduced
1983,1997	Steelhead	DFG	N
1983	Sculpin	DFG	N
1983	Roach	DFG	N
1983	Green Sunfish	DFG	I
1983	Crayfish	DFG	N

ADULT SURVEYS:

A spawning survey was conducted in Thorton Creek on 3/10/1998, beginning at the mouth and extending approximately 1090' upstream. No redds, fish, or carcasses were observed.

Another spawning/carcass survey was continued in Thorton Creek on 3/10/1998. This survey began at habitat unit 77 and extended to habitat unit 100. No redds, carcasses, or fish were observed.

DISCUSSION

Thorton Creek has three channel types: F3 (5873 ft.), G2 (1068 ft.) and F3 (1119 ft.).

There are 7,000 feet of F3 channel type in Reaches 1 and 3. According to the DFG Salmonid Stream Habitat Restoration Manual, F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, channel constrictors and log cover.

There are 1,068 feet of G2 channel type in Reach 2. According to the DFG Salmonid Stream Habitat Restoration Manual, G2 channel types are fair for log cover.

The water temperatures recorded on the survey days 11/10/97 to 11/14/97 ranged from 49°F to 51°F. Air temperatures ranged from 50°F to 59°F. This temperature regime is favorable to salmonids.

Pools comprised 21% of the total length of this survey. In first and second order streams a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. In Thorton Creek the pools are relatively deep with 67% having a maximum depth of at least 2 feet. These pools comprised 15% of the total length of stream habitat. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 23. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by root masses (28%), boulders (23%), undercut banks (16%), and terr. vegetation (16%). Log and root wad cover structures in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divide

territorial units to reduce density related competition.

One of the two low gradient riffles measured (50%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Forty five of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 16% had a rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. In a reach comparison, Reach 3 had the best ratings and Reach 1 had the poorest ratings. Reach 2 is unsuitable for spawning due to the natural geomorphology of the Reach.

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel, or because of fine sediment capping the redd and preventing fry emergence. In Thorton Creek, Reach 1 sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the entire survey was 92%. This is excellent, since 80 percent is generally considered desirable. However, the riparian buffer is thin or nearly absent in areas with agriculture. Riparian removal through increased vineyard development within the riparian corridor could all lead to less stream canopy, channel incision, causing bank erosion and higher water temperatures. Large trees required to contribute shade also provide a long term source of large woody debris needed for instream structure and bank stability.

GENERAL RECOMMENDATIONS

Thorton Creek should be managed as an anadromous, natural production stream.

Recent storms brought down many large trees and other woody debris into the stream, which increased the number and quality of pools since the drought years. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Many signs of recent and historic tree and log removal were evident in the active channel during our survey. Efforts to increase flood protection or improve fish access in the short run, have led to long term problems in the system. Landowners should be educated about the natural and positive role woody debris plays in the system, and encouraged <u>not to remove woody debris</u> from the stream, except

under extreme buildup and only under guidance by a fishery professional.

SPECIFIC FISHERY ENHANCEMENT RECOMMENDATIONS

1) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing shelter is from vegetation, boulders, and undercut banks. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in the upper reaches. This must be done where the banks are stable and the gradient moderate(Reaches 1 and 2) or in conjunction with stream bank armor to prevent erosion. In some areas the material is at hand.

2) Spawning gravels on Thorton Creek are limited. Structures to decrease channel incision and recruit spawning gravel (using gravel retention structures), could be installed to trap, sort and expand redd distribution in the stream (particularly on Thorton Creek reaches 1 and 3).

PROBLEM SITES AND LANDMARKS - THORTON CREEK SURVEY COMMENTS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

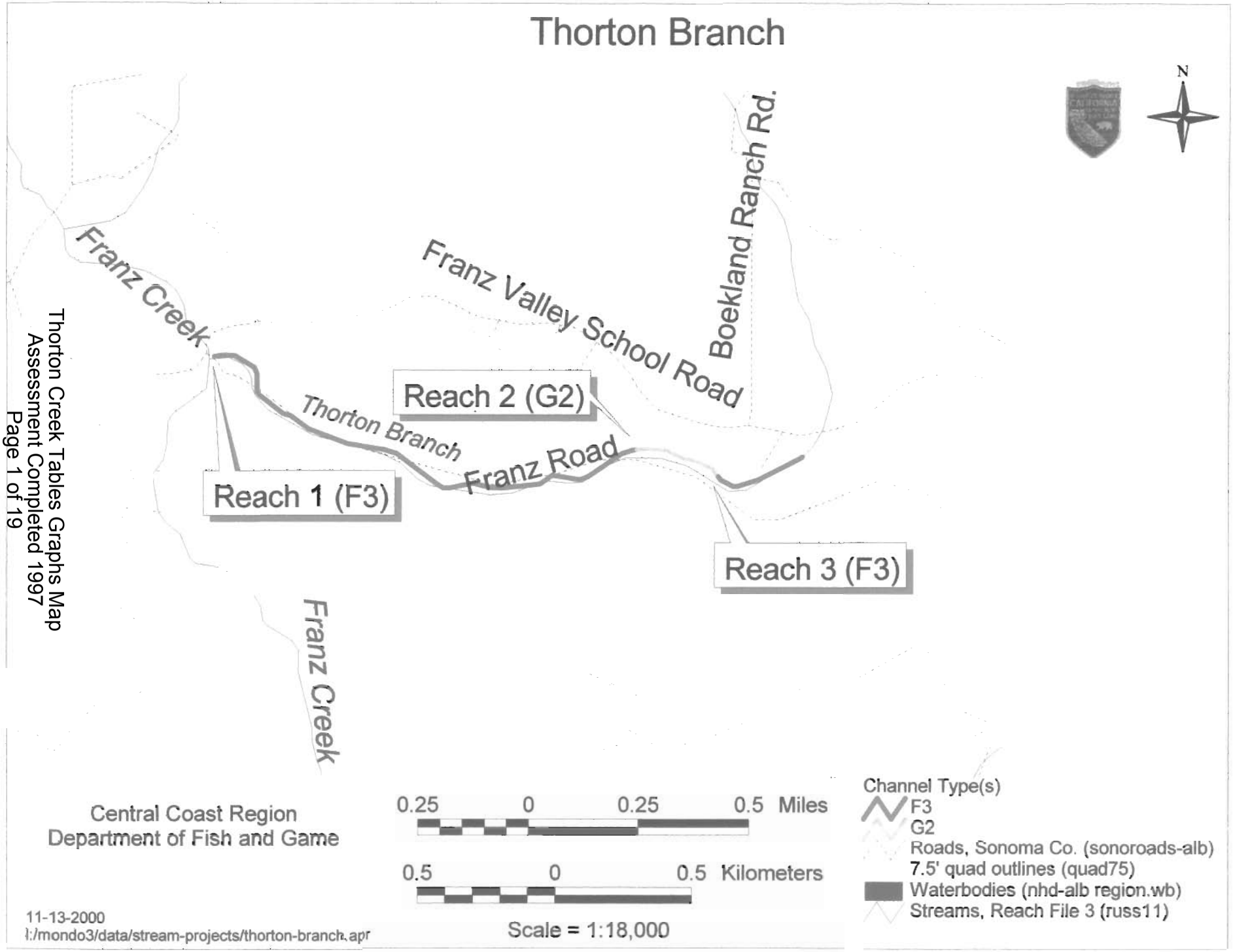
The Thorton Creek habitat survey started at the mouth.

HABITAT UNIT#	STREAM LEN(FT.)	COMMENTS
1.00	20	Thorton's water is murky. Franz's water becomes murky at confluence.
2.00	53	Vineyards both banks, Blackberry right bank.
3.00	102	Vineyards both banks, blackberry right bank.
4.00	122	Vineyards both banks, Blackberry right bank.
5.00	214	Vineyards both banks, Blackberry right bank.
6.00	243	Vineyards both banks, Blackberry both banks.Trash in creek. 4" PVC pipe sealed closed an right bank.

7.00	370	Water diversion pipe spans across creek (4" PVC). Vineyards both sides, blackberry both banks. Garbage on right bank: 2 junk trucks, swing set, fridge, and more. Garbage in creek: concrete blocks, Vineyard fencing and materials.
8.00	393	Tire right bank. Trash fencing materials left bank. Vineyards both sides.
9.00	494	Blackberry both banks. Vineyards left banks. Trash in creek.
10.00	560	Blackberry both banks. Vineyards left side. Metal siding left bank.
11.00	726	Trash right bank. Vineyard both banks. 30' X 30'(+/-) clearing for creek. Cattle smell. Blackberry both banks
12.00	756	Vineyards both banks.
13.00	797	Vineyards both sides. Blackberry both banks.
14.00	835	Vineyards and blackberry both banks, Unit #14 through 17.
16.00	879	Water diversion pipe spans across creek (6" PVC).
18.00	919	Car tire rim in creek.Vineyards both sides.
19.00	965	Vineyards both sides. Rusted car pieces in creek.
20.00	977	Blackberry and Vineyards both banks.
21.00	1018	Vineyards both sides, blackberry both banks, Units#21 through 23.
23.00	1090	House right bank.
24.00	3452	NO ACCESS
26.00	3628	Beginning of Rossi property. Dry side channel left bank.
28.00	3709	Blackberry right bank. Erosion left bank.
38.00	4049	Tire stuck in roots of tree on right bank.
44.00	4327	Orchard right bank. Erosion right bank.
45.00	4408	Orchard on right bank (Units #45 through 58).
46.00	4463	Redwood grove left bank.

49.00	4568	Erosion right bank.
50.00	4607	Erosion left bank, dry side-channel left bank.
51.00	4624	Dry side-channel left bank. Erosion left bank.
52.00	4639	Erosion right bank. Dry side-channel left bank.
53.00	4672	Erosion right bank. Dry side-channel left bank.
54.00	4692	Erosion right bank. Dry side-channel left bank.
55.00	4751	Erosion and blackberry right bank. Dry side-channel begins at start of unit on left side of channel. Dry tributary on left bank.
56.00	4791	Blackberry right bank.
58.00	4866	Blackberry on both banks. Orchard right bank.
59.00	4910	Blackberry right bank. 2" metal pipe submerged in water, right bank. Dry tributary right bank.
61.00	5005	Bridge #1.
63.00	5109	Erosion right bank. Log jam spans width of creek, about 6' long.
64.00	5120	Erosion left bank.
65.00	5191	Erosion left bank.
66.00	5224	Erosion right bank.
67.00	5266	Dry tributary left bank.
68.00	5304	Erosion left bank.
76.00	6280	1+ SHD
80.00	6606	Two 0+ SHD. 20' X 15' orange sulfur. Two springs. Dry tributary right bank.
81.00	6622	0+ SHD. Rough-skinned newt. 1" metal pipe. First morning after a storm.
85.00	6775	Sulfur spring right bank. Orange sulfur deposits in water.
87.00	6844	Wire mesh (20' X 5') in creek.
88.00	6857	Fresh water snails.
89.00	6876	Dry side-channel.
91.00	6946	Blackberry right bank.
95.00	7353	Two tires in creek.
96.00	7710	House right bank. Blackberry covers both banks throughout second half of unit.
97.00	7760	Blackberry covers both banks.

98.00	7889	Vegi garden left bank. Trail crossing.
99.00	7914	Rock wall and 2" metal pipe.
100.00	8066	END SURVEY: landowner said Thorton was dry before current rains, and that it is dry most years in and upstream of unit #100. Fork at start of unit. Sharp grass covers banks.


Thorton Branch
N
Franz Creek
Franz Valley School Road
Boekland Ranch Rd.
Reach 2 (G2)
Thorton Branch
Franz Road
Reach 1 (F3)
Reach 3 (F3)
Franz Creek
Central Coast Region
Department of Fish and Game
0.25 0 0.25 0.5 Miles
0.5 0 0.5 Kilometers
Scale = 1:18,000
11-13-2000
I:/mondo3/data/stream-projects/thorton-branch.apr
Channel Type(s)
F3
G2
Roads, Sonoma Co. (sonoroads-alb)
7.5' quad outlines (quad75)
Waterbodies (nhd-alb region.wb)
Streams, Reach File 3 (russ11)

Thorton Branch, Franz — Drainage: Russian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 11/10/97 to 11/14/97

Confluence Location: QUAD: — LEGAL DESCRIPTION: — LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
1	0		1	0	0	0	0.0	0.0	0	0	0	0	0	0
8	3	RIFFLE	8	24	191	3	4.8	0.4	140	1121	60	478	0	5
42	6	FLATWATER	42	90	3791	66	6.4	0.6	760	31936	509	21370	0	20
49	17	POOL	49	35	1731	30	9.0	1.4	312	15302	433	21202	301	23
1	0	DRY	1	11	11	0	0.0	0.0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
101	26	5724	48359	43049

Thorton Branch, Franz — Drainage: Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 11/10/97 to 11/14/97

Confluence Location: QUAD: — LEGAL DESCRIPTION: — LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
1	0		1	0	0	0	0	0.0	0.0	0	0	0	0	0	0	0
7	2	LGR	7	21	150	3	5	0.4	1.3	113	789	41	286	0	3	95
1	1	BRS	1	41	41	1	5	0.5	1.0	195	195	97	97	0	10	95
1	1	GLD	1	18	18	0	8	0.5	0.8	144	144	72	72	0	0	95
22	3	RUN	22	50	1090	19	6	0.6	1.4	415	9136	248	5462	0	33	83
19	2	SRN	19	141	2683	47	6	0.7	1.6	1311	24908	915	17384	0	13	95
17	6	MCP	17	35	591	10	8	1.3	3.3	299	5082	378	6424	259	20	91
2	1	STP	2	43	87	2	9	1.2	3.0	289	579	371	742	165	40	90
1	1	CRP	1	31	31	1	8	1.0	1.5	233	233	233	233	93	5	85
2	1	LSL	2	24	47	1	8	1.6	3.7	192	385	325	650	287	90	95
15	4	LSR	15	38	570	10	10	1.4	3.3	363	5444	508	7616	358	18	94
9	2	LSBk	9	38	346	6	7	1.3	3.0	301	2708	407	3662	294	13	90
3	2	LSBo	3	20	60	1	16	2.2	4.7	291	872	650	1950	464	43	98
1	0	DRY	1	11	11	0	0	0.0	0.0	0	0	0	0	0	0	95

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
101	26	5724	50474	44578

Thorton Branch, Franz

Drainage: Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 11/10/97 to 11/14/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
1	0		2	0	0	0	0.0	0.0	0	0	0	0	0	0
19	7	MAIN	38	36	677	39	8.3	1.3	298	5661	377	7166	249	22
30	10	SCOUR	60	35	1054	61	9.5	1.5	321	9641	469	14072	335	24

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
50	17	1731	15302	21238

Thorton Branch, Franz — Drainage: Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 11/10/97 to 11/14/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

UNITS MAX DPTH MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
0	XXXXXXXXX	0	0	0	0	0	0	0	0	0	0	0
17	MCP	34	0	0	8	47	8	47	1	6	0	0
2	STP	4	0	0	1	50	0	0	1	50	0	0
1	CRP	2	0	0	1	100	0	0	0	0	0	0
2	LSL	4	0	0	0	0	1	50	1	50	0	0
14	LSR	28	0	0	3	21	7	50	4	29	0	0
9	LSBk	18	0	0	2	22	6	67	1	11	0	0
3	LSBo	6	0	0	0	0	0	0	2	67	1	33

TOTAL UNITS 48

Thorton Branch, Franz — Drainage: Russian River

Table 5 - Summary of Shelter by Habitat Type — Survey Dates: 11/10/97 to 11/14/97

Confluence Location: QUAD: — LEGAL DESCRIPTION: — LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	% TOTAL UNDERCUT BANKS	% TOTAL SWD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
1	0		0	0	0	0	0	0	0	0	0
7	2	LGR	0	0	0	0	90	0	0	10	0
1	1	BRS	0	0	0	0	100	0	0	0	0
1	1	GLD	0	0	0	0	0	0	0	0	0
22	3	RUN	0	2	0	0	72	21	0	5	0
19	3	SRN	4	16	0	1	56	0	0	22	0
17	17	MCP	14	7	0	23	37	8	0	10	0
2	2	STP	0	1	0	0	0	0	0	99	0
1	1	CRP	0	0	0	0	100	0	0	0	0
2	2	LSL	0	41	32	24	3	0	0	0	0
15	15	LSR	21	7	2	58	8	0	0	0	5
9	9	LSBk	50	5	0	11	6	0	0	5	23
3	3	LSBo	2	8	0	3	0	0	0	87	0
1	1	DRY	0	0	0	0	0	0	0	0	0
101	60	HABITAT TYPES	12	9	2	19	31	5	0	20	3
49	49	POOLS ONLY	16	9	3	28	16	3	0	23	4

Thorton Branch, Franz — Drainage: Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE — Survey Dates: 11/10/97 to 11/14/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

TOTAL HABITAT UNITS	UNITS SUBSTRATE MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
1	0		0	0	0	0	0	0	0
2	2	LGR	0	0	0	50	50	0	0
1	1	BRS	0	0	0	0	0	0	100
1	1	GLD	0	0	100	0	0	0	0
3	3	RUN	0	0	67	0	33	0	0
2	2	SRN	0	0	50	50	0	0	0
6	6	MCP	0	67	17	17	0	0	0
1	1	STP	0	0	0	0	0	100	0
1	1	CRP	0	100	0	0	0	0	0
1	1	LSL	0	100	0	0	0	0	0
4	4	LSR	0	25	25	50	0	0	0
2	2	LSBk	0	50	0	0	0	0	50
2	2	LSBo	0	50	0	0	0	50	0
1	1	DRY	0	0	0	100	0	0	0

Thorton Branch, Franz

APPENDIX A. Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Right bank % Cover	Mean Left Bank % Cover
91.67	36.57	63.43	82.93	72.76

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	0	2	3.45
Boulder	2	3	8.62
Cobble/Gravel	0	1	1.72
Silt/clay	27	23	86.21

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	0	1	1.72
Brush	16	14	51.72
Deciduous Trees	6	5	18.97
Evergreen Trees	7	9	27.59
No Vegetation	0	0	0

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Thorton Branch, Franz
SAMPLE DATES: 11/10/97 to 11/14/97
SURVEY LENGTH:
MAIN CHANNEL: 5698 ft. SIDE CHANNEL: 26 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Latitude: 0°0'0"
Legal Description: Longitude: 0°0'0"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-75)

Channel Type: F3	Mean Canopy Density: 93%
Main Channel Length: 3511 ft.	Evergreen Component: 18%
Side Channel Length: 26 ft.	Deciduous Component: 82%
Riffle/Flatwater Mean Width: 6.6 ft.	Pools by Stream Length: 37%
Pool Mean Depth: 1.4 ft.	Pools >=2 ft. Deep: 72%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 19%
Water: 49-51°F Air: 52-59°F	Mean Pool Shelter Rtn: 19
Dom. Bank Veg.: Brush	Dom. Shelter: Root masses
Bank Vegetative Cover: 79%	Occurrence of LOD: 19%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 11 ft.
Embeddness Value: 1. 14% 2. 41%	3. 16% 4. 30%

STREAM REACH 2 (Units 76-91)

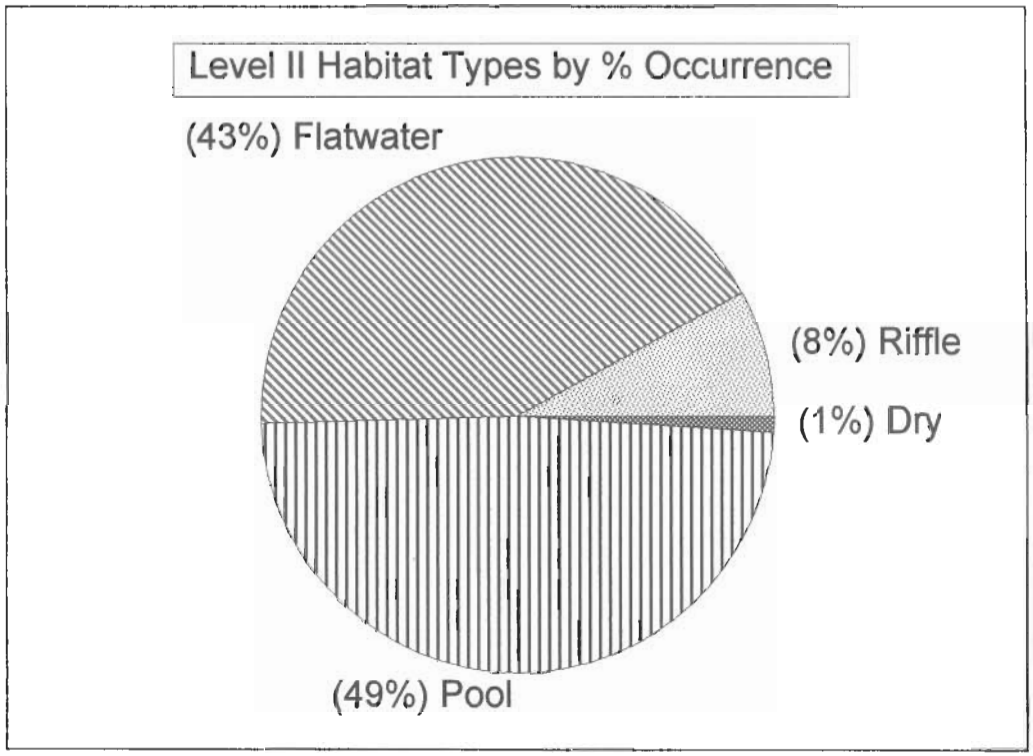
Channel Type: G2	Mean Canopy Density: 92%
Main Channel Length: 1068 ft.	Evergreen Component: 75%
Side Channel Length: 0 ft.	Deciduous Component: 25%
Riffle/Flatwater Mean Width: 5.0 ft.	Pools by Stream Length: 22%
Pool Mean Depth: 1.6 ft.	Pools >=2 ft. Deep: 63%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 50%
Water: 49-51°F Air: 50-57°F	Mean Pool Shelter Rtn: 40
Dom. Bank Veg.: Brush	Dom. Shelter: Boulders
Bank Vegetative Cover: 76%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.
Embeddness Value: 1. 13% 2. 38%	3. 0% 4. 50%

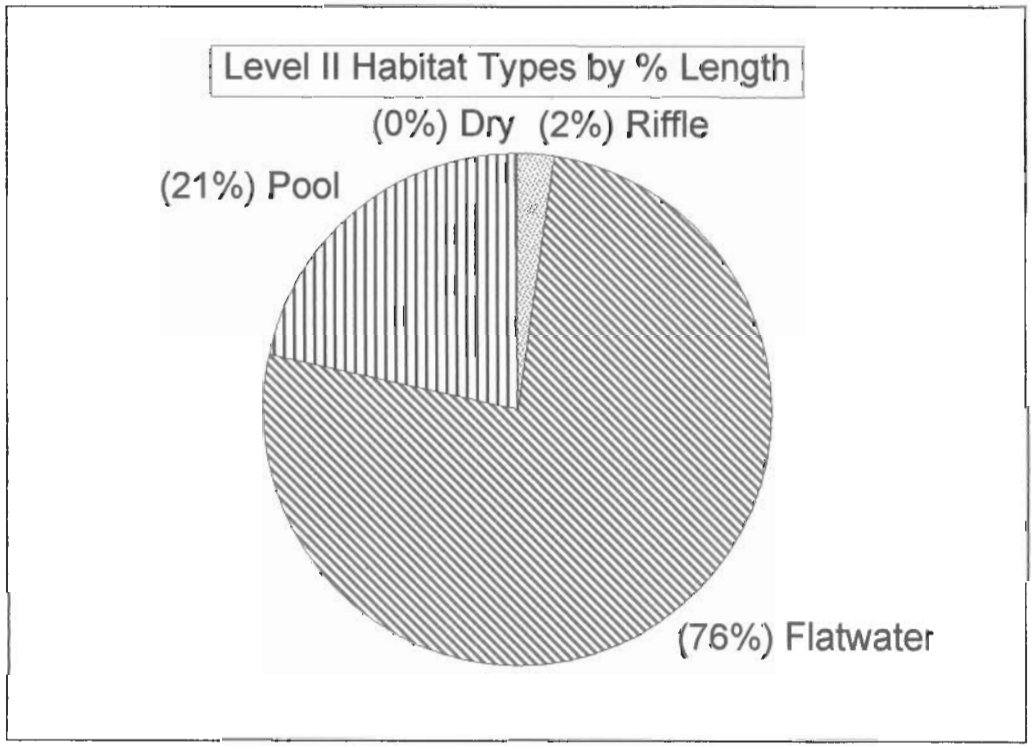
STREAM REACH 3 (Units 92-100)

Channel Type: F3	Mean Canopy Density: 82%
Main Channel Length: 1119 ft.	Evergreen Component: 71%
Side Channel Length: 0 ft.	Deciduous Component: 29%
Riffle/Flatwater Mean Width: 5.8 ft.	Pools by Stream Length: 16%
Pool Mean Depth: 0.9 ft.	Pools >=2 ft. Deep: 50%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 0%
Water: 49-49°F Air: 57-57°F	Mean Pool Shelter Rtn: 21
Dom. Bank Veg.: Brush	Dom. Shelter: Terrestrial Veg.
Bank Vegetative Cover: 79%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.
Embeddness Value: 1. 50% 2. 25%	3. 25% 4. 0%

Thorton Creek

Level II Habitat Types

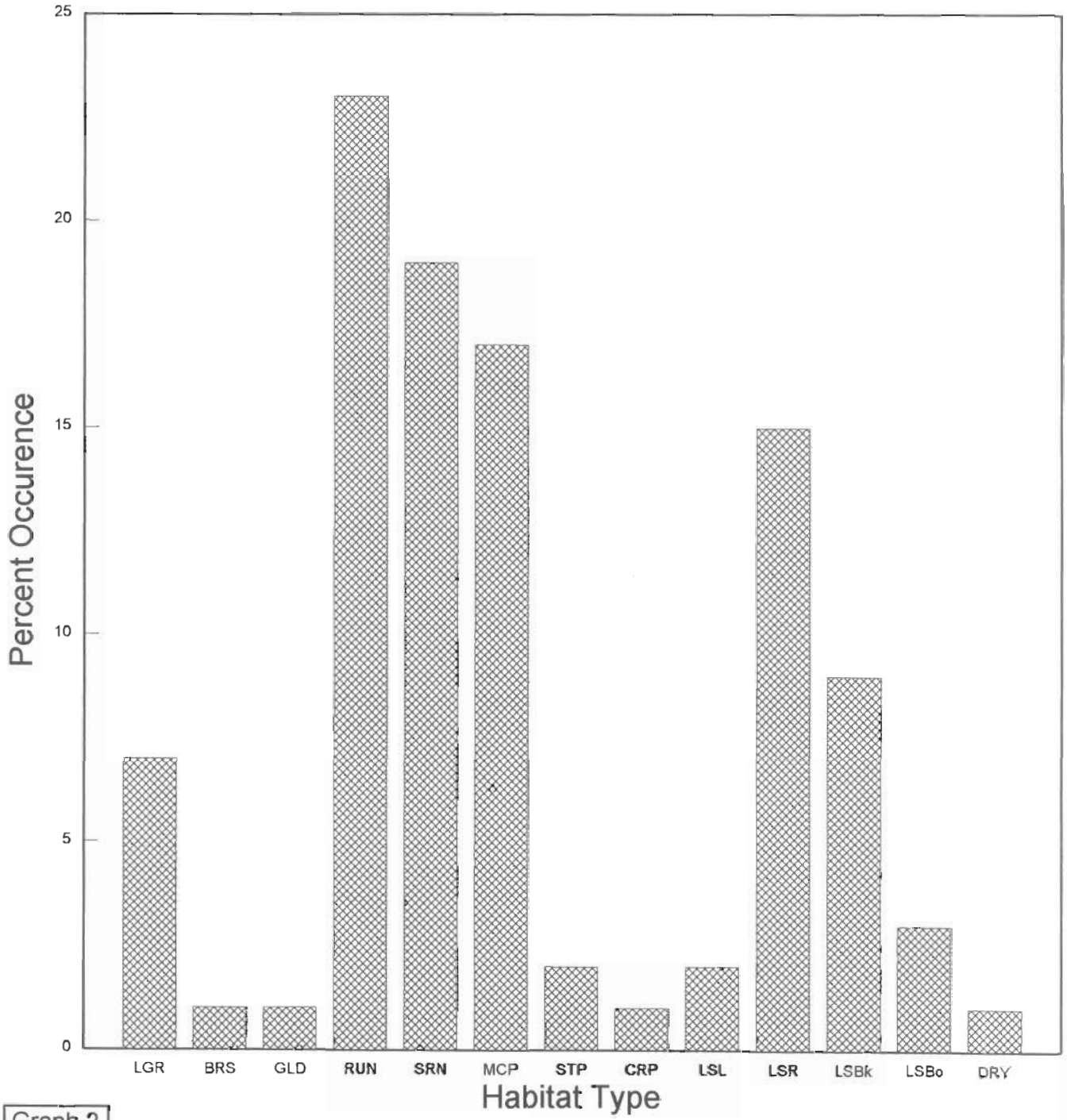




Graph 1

Thorton Creek

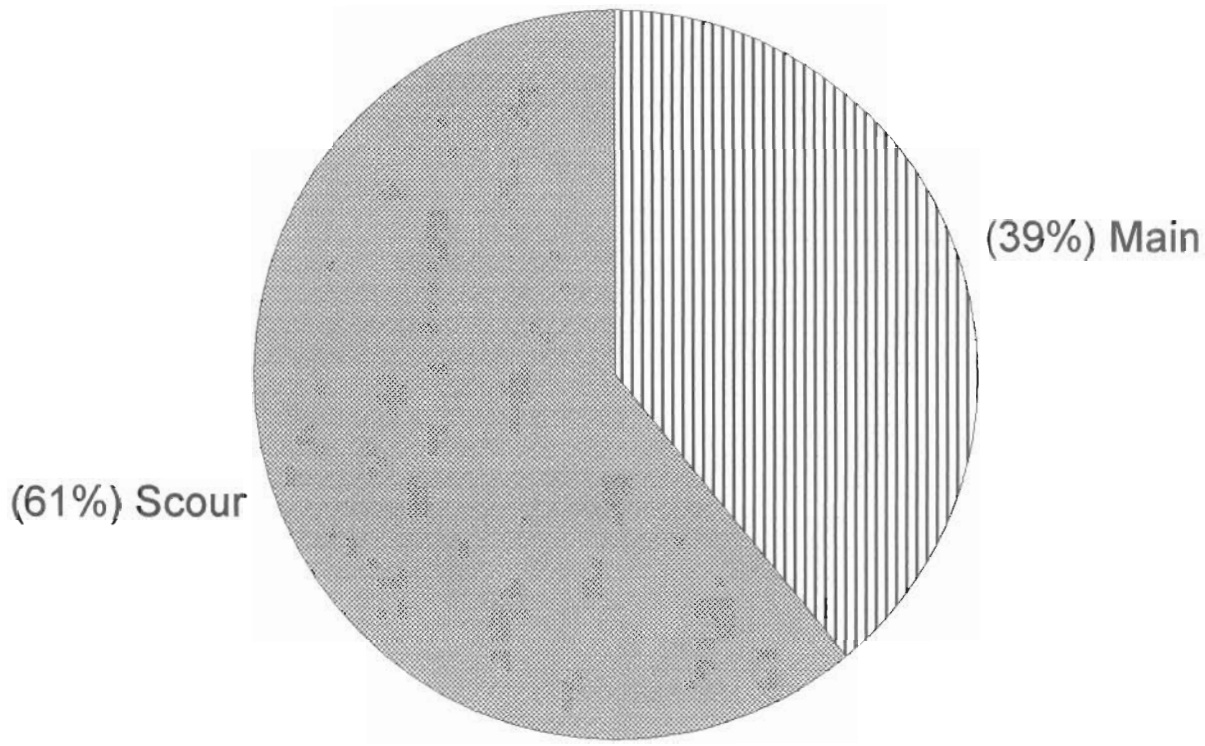
Level IV Habitat Types by % Occurrence



Graph 2

Thorton Creek

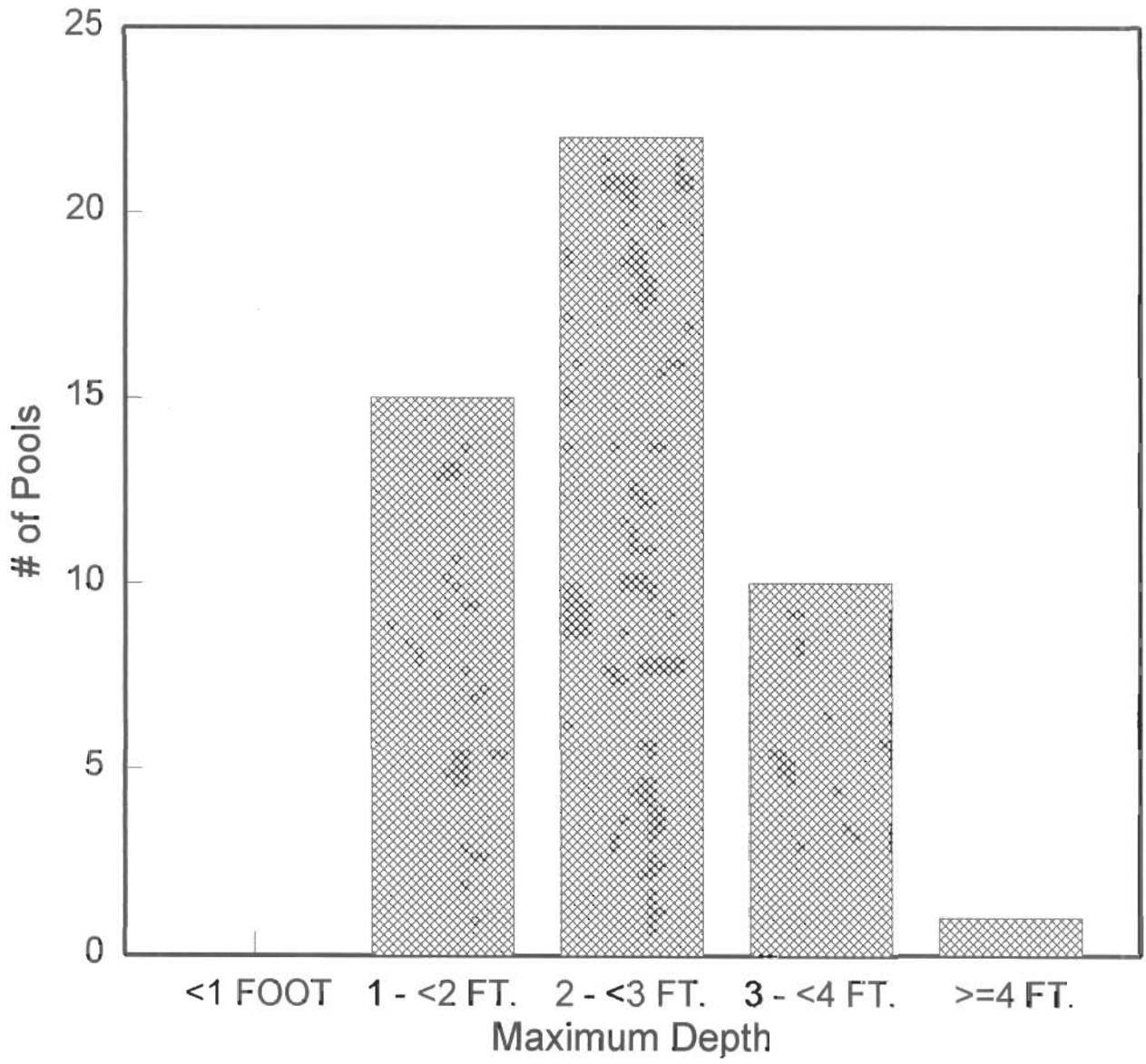
Pool Habitat Types by % Occurrence



Graph 3

Thorton Creek

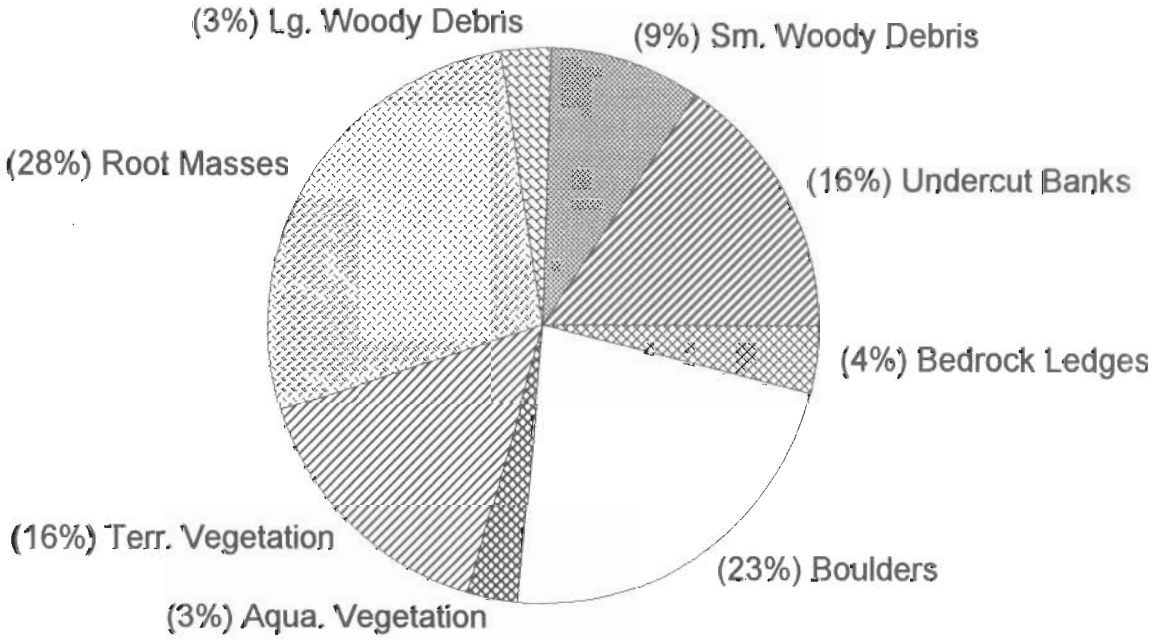
Maximum Depth in Pools



Graph 4

Thorton Creek

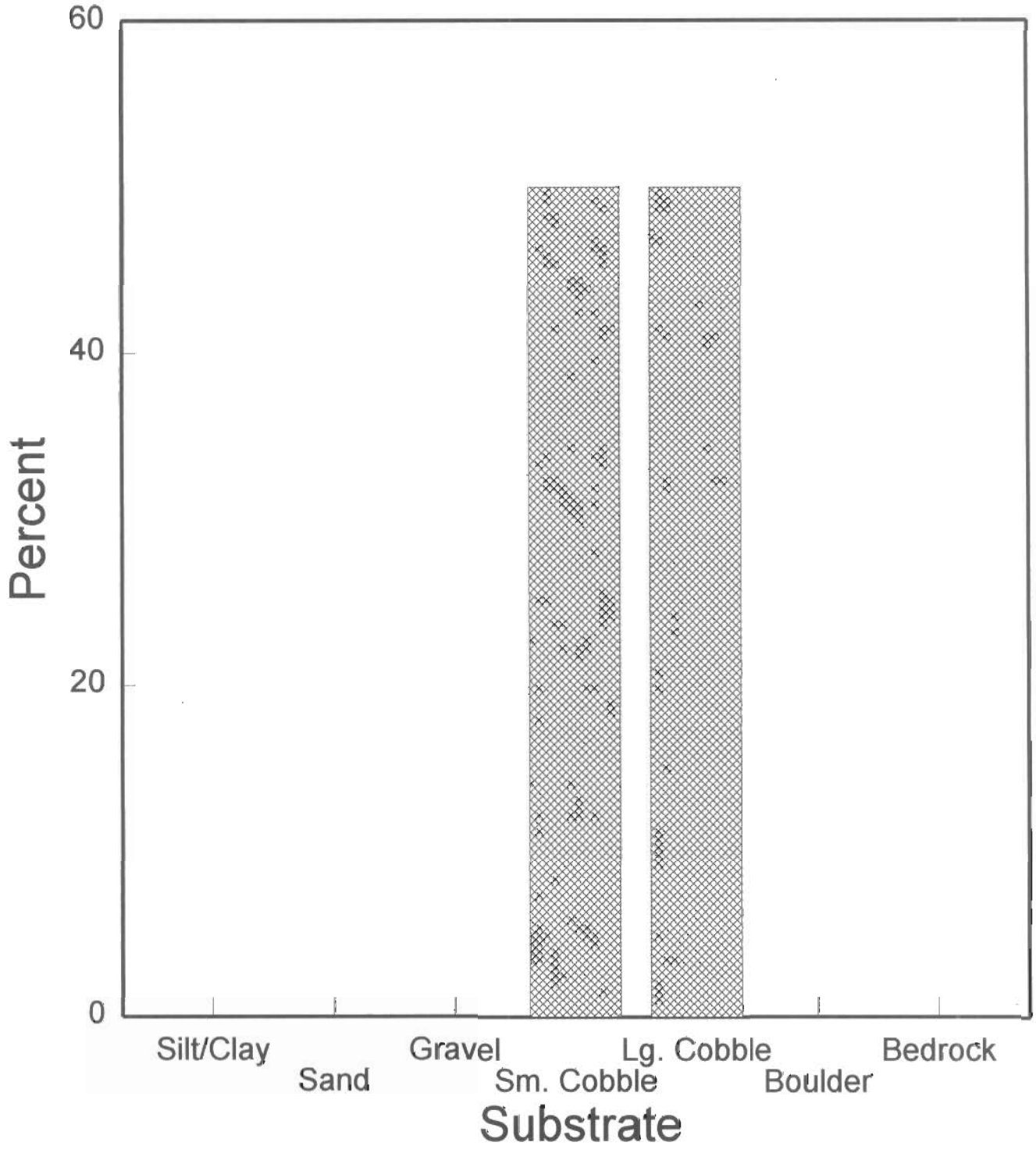
Pool Shelter Types by % Area



Graph 5

Thorton Creek

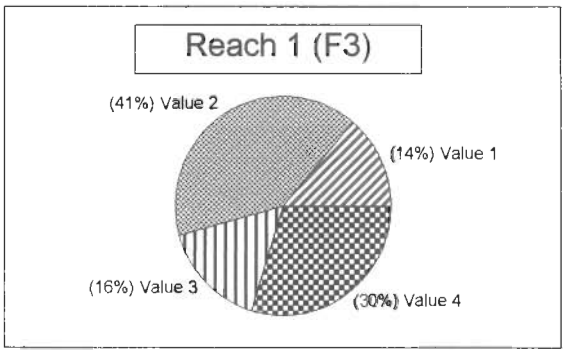
Substrate Composition in Low Gradient Riffles

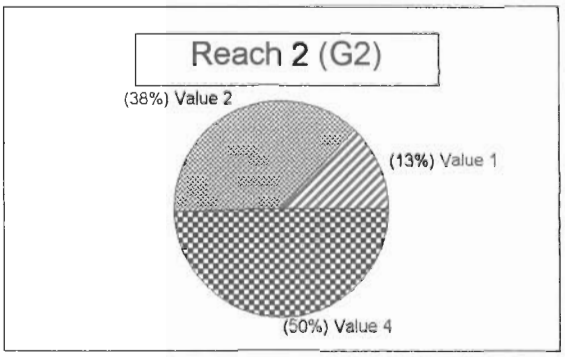


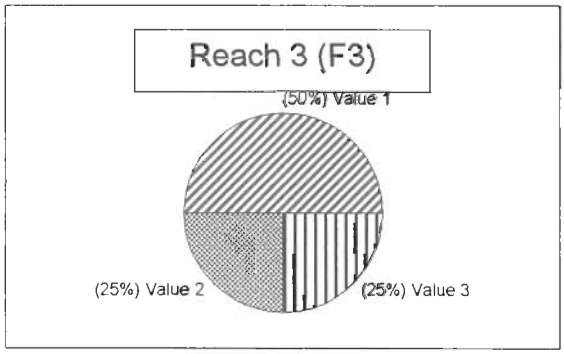
Graph 6

Thorton Branch, Franz

Percent Cobble Embeddedness by Reach





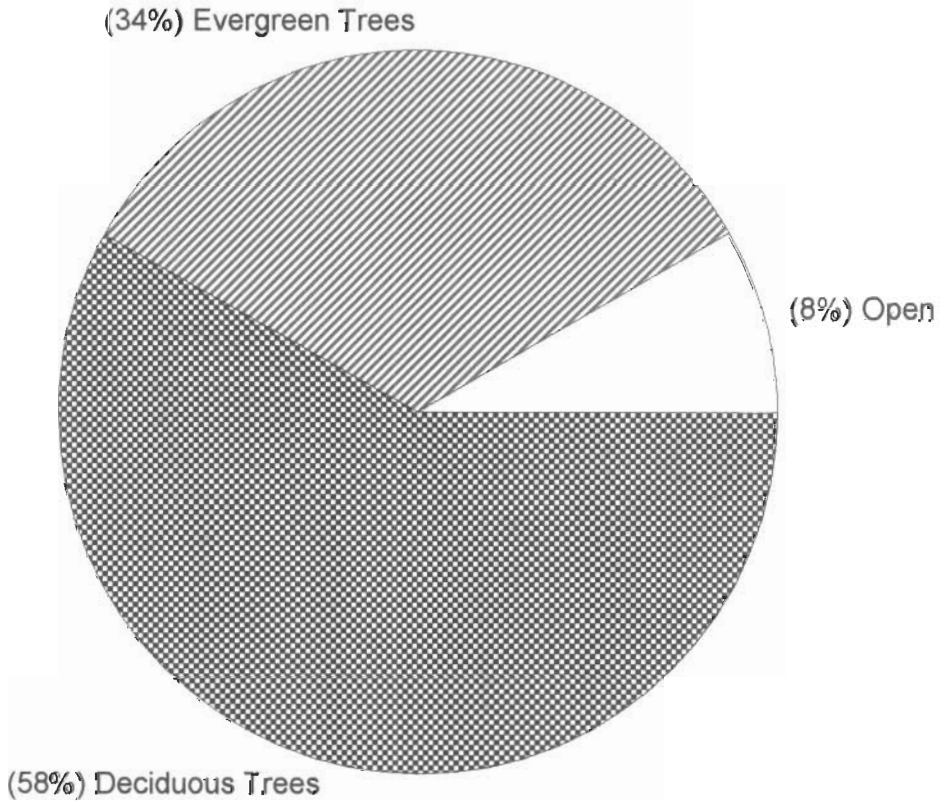


Value 1 = <25% Value 2 = 25-50% Value 3 = 51-75% Value 4 = >76%

Graph 7

Thorton Creek

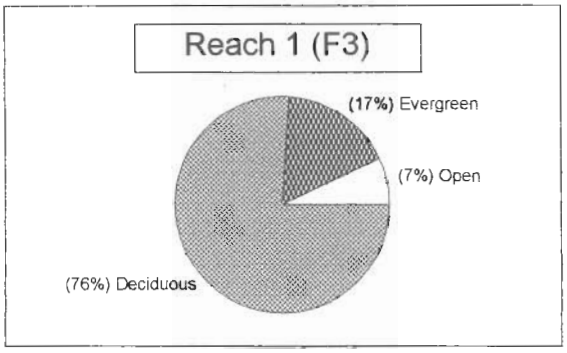
Mean Percent Canopy

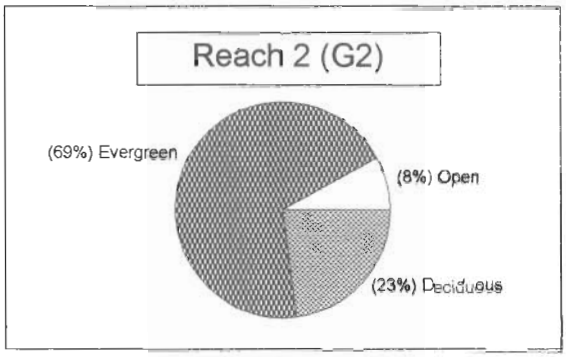


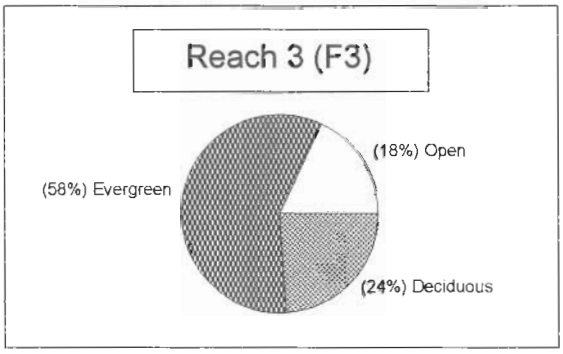
Graph 8

Thorton Branch, Franz

Percent Canopy By Reach



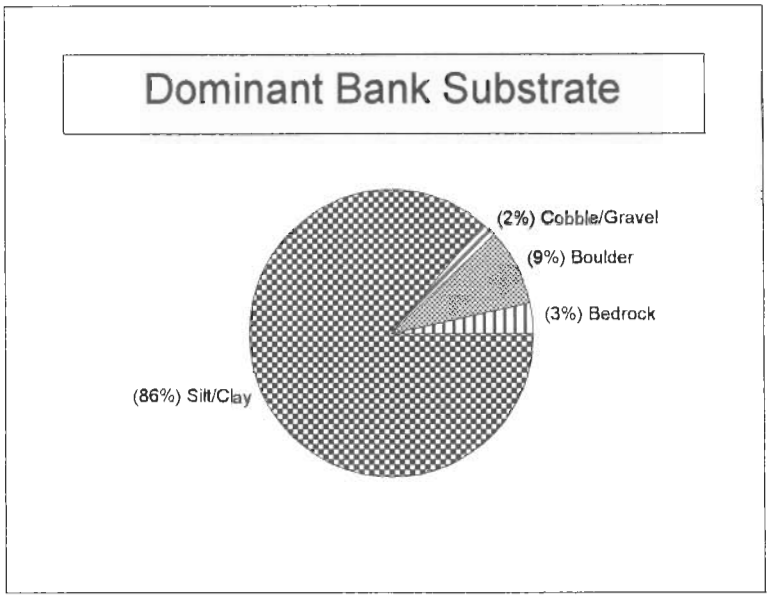


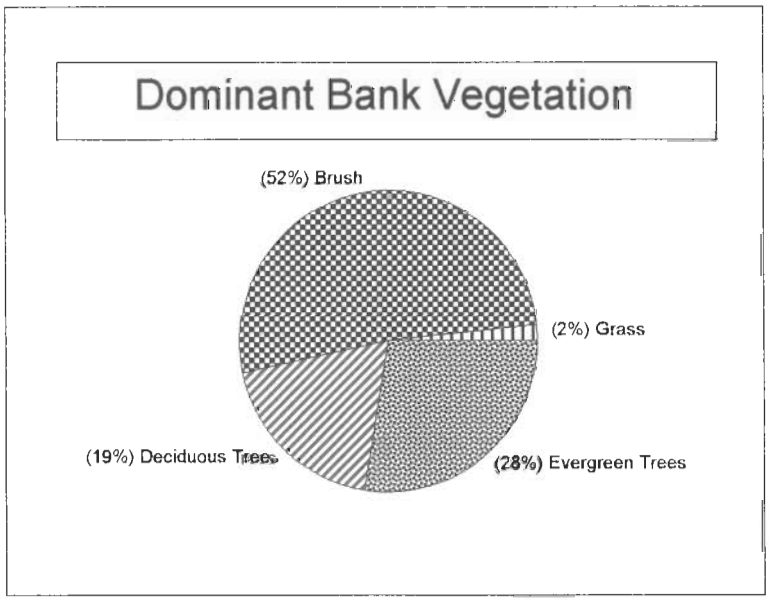


Graph 9

Thorton Creek

Percent Bank Composition





Graph 10